devoted to an account of the origin and destruction of these bergs, Prof. Chun passes to a consideration of the Antarctic plankton. The *Valdivia's* researches were made at the height of the summer, when the surface fauna and flora were at their richest. In many respects they resemble those of the Arctic region, the most striking difference being the complete absence of Ceratium and the rarity of other dinoflagellates, the place of which was taken by immense numbers of diatoms, especially those of the genus Chætoceras. The greatest richness of the plankton was reached at 20–40 fathoms, the poverty of the surface waters being probably due to their lower specific gravity owing to the presence of melting ice. A twilight flora (Schattenflora), such as is found in the lower layers of the surface waters in tropical seas, is wanting in the Antarctic. On December 17, the ship was brought to a stand by the pack-ice some hundred miles north of Enderby Land in 2300 fathoms, and bore away north-west to Kerguelen. A dredging taken shortly after this showed a rather rich fauna and brought up a glacier-borne boulder of red sandstone, proving that Enderby Land is not of purely volcanic origin.

The voyage northwards across the Indian Ocean, which was saddened by the death of Dr. Bachmann, the physician and bacteriologist of the expedition, does not appear to have produced any very startling results. After leaving Padang in Sumatra, researches were made on the deep basin (some 1000 fathoms) between Sumatra and the Mentawi Islands. This basin is separated from the open ocean by a ridge of only 400 fathoms, on which the group is situated, and the bottom temperature is therefore higher (5°·9 C.) than that outside the islands. At the same time there is a very rich surface flora. Consequently the bottom fauna is extraordinarily rich. In this neighbourhood a specimen of Spirula was taken in perfect condition. A short visit to Suvadiva Atoll in the Maldives gives the author an opportunity for some remarks on that group. Since this visit, however, our formerly scanty knowledge of the Maldive Islands has been so vastly increased by Mr. Stanley Gardiner's expedition that the observations of the *Valdivia* are deprived of any value they might otherwise have had. Prof. Chun's ethnological conclusions are not very different from Mr. Gardiner's, but we very much doubt whether the latter author would accept the suggestion that the Maldives are built on a submarine mountain range. On the voyage to Diego Garcia, the very important discovery was made that the Chagos group and the Maldives are connected by a bank in 1100 to 1500 fathoms, this bank being sundered from that on which the Seychelles lie by a narrow channel only. The last section of the voyage in the Indian Ocean, that along the East African coast from Dar-es-Salaam northwards, in 500–700 fathoms, yielded the richest dredgings in the whole cruise.

At the end of the volume are some chapters on the deep-sea animals captured by the expedition and on general considerations concerning the oceanic fauna and flora. The "catch" was, on the whole, very much what might have been expected, and seems to contain many interesting forms, but few startling novelties. Hexactinellid sponges, actinozoa and echinoderms are naturally numerous, and giant forms of ostracoda, cirripedia and larvacea were taken. Deep-sea ctenophores were discovered, and some of the fish are perhaps even more bizarre than those that were already known from the deep sea. Naturally, the collections have not yet been sufficiently examined to enable general conclusions to be drawn from them with certainty, but Prof. Chun seems to incline to the view that the bottom faunas of the Arctic, Antarctic, Atlantic and Indian areas entitle them to be considered as distinct regions, in spite of the marked convergence between the members of the first pair and the identity of many species in the second. The surface fauna, and especially the surface flora, is much more peculiar in each region than the fauna of the bottom, but that of intermediate depths has a very uniform character in all, and, since many animals pass from the surface to lower layers of the water at fixed times of the year, it is possible to account for the cosmopolitan distribution of certain forms. On the subject of bipolarity, Prof. Chun is at present disinclined to pass an opinion.

To sum up in a few words the results of such an undertaking as the German deep-sea expedition is difficult. But it may, we think, be fairly said that not only have two or three discoveries of the first importance been made—such as the soundings in the neighbourhood of the Chagos group and off Walfish Bay, the "tailing off" of the pelagic fauna below 1000 fathoms, and the observations regarding Bouvet Island, but a mass of valuable information has been gathered which, when digested and discussed in the light of the facts accumulated by other expeditions, will set forward very notably our knowledge of the biology and physiography of the sea.

It is impossible to end a notice of this work without referring to the beautiful way in which it is brought out. The print, the margins, the numerous and artistic photographs, and the headpieces quaintly contrived out of representations of sea animals are all beyond praise and can only be made possible in a work issued at the price of the present one by a wide popular appreciation in Germany of the results of the expedition. What sort of public would such a work find in English?

L. A. B.

CHEMICAL ANALYSIS.

Practical Chemistry. By Abegg and Herz. Translated by H. T. Calvert, B.Sc. Pp. xiii+118. (London: Macmillan and Co., Ltd.) Price 6*s.*

THIS little work, which deals mainly with qualitative analysis, is based upon the principles of modern physical chemistry. The equations representing "reactions in solution" are written in the ionic form, thus:—

$$Mn^{\cdot\cdot} + 2OH' = \mathbf{Mn(OH)_2}$$
$$Fe^{\cdot\cdot\cdot} + PO_4''' = \mathbf{FePO_4}.$$

This method of representing reactions in solution as being entirely dependent upon the "ions" has its advantages, but it also has certain disadvantages. In most text-books the above equations would be represented by the action of definite salts, as, *e.g.*,

$$MnSO_4 + 2KOH = Mn(OH)_2 + K_2SO_4$$
$$FeCl_3 + Na_2HPO_4 = FePO_4 + HCl + 2NaCl.$$

When expressed in the latter form, students are apt to

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suppose that the reaction only takes place when the special salt mentioned in the book is used, and if any other salt of the metal is offered to them to say, "but the book says such and such a salt is to be used." On the other hand, when the equations are expressed in the ionic form, as above, the student is perhaps inclined to forget that the anion of the metal and the cation of the reagent also interact.

There are those who look upon the "ionisation theory" as absolutely false and will have none of it. Others, mistaking theory for fact, ridicule all other theories and dogmatically state that *all* difficulties are surmounted when approached by means of the ionic theory. There are many, however, who, without subscribing to the opinions of the extremists, recognise in the ionic theory an extremely useful working hypothesis. Chemical analysis, which is apt to be dry and dull when viewed in—dare we say—the old-fashioned manner, becomes not only interesting, but many of the reactions which were obscure become clear in the light of the ionic theory. Thus, is the action of caustic alkalis upon ferric ferrocyanide (Prussian blue) always clear to students of the old regime? They are told that caustic alkalis decompose the compound according to the following equation:—

$$Fe_7(CN)_{18} + 12KOH = 4Fe(OH)_3 + 3K_4Fe(CN)_6 ;$$

but this does not explain why the whole of the iron is not precipitated as ferric hydrate. Now according to the ionic theory, this would be explained by saying that Prussian blue is dissociated into the cations $4Fe^{\cdots}$ and the complex anions $3Fe(CN)_6''''$ and that only the iron present as the cation is acted upon by the OH' of the potassium hydrate.

The arrangement of the book before us is in some respects peculiar. The student is first instructed how to construct a wash-bottle. This is followed on p. 3 by the preparation of hydrogen. The preparation of oxygen comes after that of hydrochloric acid and sulphuretted hydrogen, and is followed in succession by the methods of preparation of chlorine, sulphur dioxide, carbon dioxide and ammonia.

The analytical portion covers the usual ground and contains the usual reactions. Some portions of the chapter on "theoretical foundations" are far from clear, and we very much question whether the average reader will readily understand the two and a half pages on hydrolysis.

In a pocket at the end of the book there is a rather ingenious blank draught-board with the cations arranged along the top and the anions down the side. The compounds formed by the various ions are to be indicated in their proper squares, and if they are precipitates they may be indicated by shading or by filling in with coloured chalks.

The book has a table of contents, but no index. Even if the German edition was not indexed, surely the translator might have supplied one.

By the way, would it not be well if English writers of chemistry books would arrange always to write the positively charged ion in the same way? As it is, we find it sometimes spelt cation and sometimes kation.

F. M. P.

THE MOVEMENTS OF THE FOOT AND WRIST.

Der Gang des Menschen. iv. Thiel. *Ueber die Bewegung des Fusses und die auf denselben einwirkenden Kräfte.* Von Otto Fischer. Pp. 86; 3 plates. (Leipzig: Teubner, 1901.) Price Mk. 5·50.

Ueber die Bewegungen in den Handgelenken. Von Rudolf Fick. Pp. 54; with 8 figures in text and 10 plates. (Leipzig: Teubner, 1901.) Price Mk. 6·50.

IT is strange that two men, working side by side within the same university, publishing results of investigations on similar subjects in consecutive pages of the *Proceedings* of the same learned society, should produce two treatises so diverse in nature as those of Dr. Otto Fischer and Prof. Fick. Each employs a peculiar and comparatively new method for the solution of problems which have been thumbmarked by ten generations of anatomists. Dr. Fischer is a mathematician as well as an anatomist, a combination so rare that, in applying the later methods of mathematical physics to the elucidation of the movements of the human body in walking, he has left his colleagues far behind and is almost without audience or critic. Prof. Fick's paper is the result of the application of Röntgen rays to the study of the complex movements of the wrist-joint, a method only comparatively new.

If these authors differ in the methods they have employed they are alike in this, that they are minute, painstaking and accurate, investigating fully every fact for its own sake, with no thought whatsoever as to its utility. Prof. Fick has determined in millimetres the extent and direction of the movements undergone by each of the nine carpal bones during flexion, extension, abduction and adduction of the wrist. In the last paragraph of his paper he sums up his main result as follows:—

> "In conclusion I would once more emphasise, what this research has again demonstrated, that the mid-carpal joint is indeed no paltry minor articulation (Kein unwichtiges Nebengelenk) deserving the stepmotherly consideration (stiefmütterliche Berucksichtung) extended to it by most practitioners, but that, for many movements of the hand, it is emphatically the chief joint."

In this conclusion the author, as he himself explicitly states, only verifies the observation made many years ago by Henke. The elaborate and expensive plates, the type and style in which Prof. Fick's work has been published, make an English anatomist envy the wealth of a German society that is able to devote so much of its funds to the elucidation of so small a part of the human body.

In his last contribution to the Kinematics of the human gait, Dr. Fischer dealt with the movements of the lower extremity during the cycle of a double stride; in this, his fourth contribution, he considers the movements of the foot during a corresponding period. The foot is dealt with as if it were detached from and independent of the rest of the body. The forces which act on it during the cycle of a double stride are traced to four sources, viz the muscles (extensor and flexors of the foot), weight of the body, weight of the foot and reaction of the ground. The points at which these forces are applied and the centre of gravity of the foot are determined and diagrammatically represented. The velocity and acceleration of the

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